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Request for grant of a patent

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Cardiff Road
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1. Your reference LCED1

2. Patent application number *(The Patent Office will fill in this part)* 23 APR 1996 **9608381.1**

3. Full name, address and postcode of the or of each applicant *(underline all surnames)*

WILLIAM JOHN BAILLIE-HAMILTON
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Patents ADP number *(if you know it)* 6979595001

If the applicant is a corporate body, give the country/state of its incorporation

4. Title of the invention COMBINED LIGHT EMITTING AND LIGHT GUIDE COLLECTION AND OUTPUT DEVICE.

5. Name of your agent *(if you have one)*

"Address for service" in the United Kingdom to which all correspondence should be sent *(including the postcode)*

JOHN HAMILTON
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Patents ADP number *(if you know it)* 6979160300 1

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and *(if you know it)* the or each application number

Country	Priority application number *(if you know it)*	Date of filing *(day / month / year)*

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application	Date of filing *(day / month / year)*

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? *(Answer 'Yes' if:*

a) any applicant named in part 3 is not an inventor, or
b) there is an inventor who is not named as an applicant, or
c) any named applicant is a corporate body.
See note (d))

NO.

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Continuation sheets of this form	
Description	9
Claim(s)	
Abstract	
Drawing(s)	3

10. If you are also filing any of the following, state how many against each item.

Priority documents	
Translations of priority documents	
Statement of inventorship and right to grant of a patent *(Patents Form 7/77)*	
Request for preliminary examination and search *(Patents Form 9/77)*	
Request for substantive examination *(Patents Form 10/77)*	
Any other documents *(please specify)*	

11. I/[redacted] request the grant of a patent on the basis of this application.

Signature W. J. Baillie-Hamilton. Date 22-4-96

12. Name and daytime telephone number of person to contact in the United Kingdom JOHN BAILLIE-HAMILTON 01344 60[illegible]89

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Combined Light emitting and light guide collection and output device.

This invention relates to a combined light or electro magnetic energy emitting device, which optimises the input of this energy directly into a light conducting element, for example light guides or optical fibres.

Light conducting elements for example fibre optics, are a well known means of conducting light energy from a remote source to a desired destination, state of the art fibres allow large amounts of energy to be transported through very small fibres, that are flexible, strong, and water resistant, the cost of these fibres are relatively small, as long as the number of fibres used are kept to a minimum.

However inputting light energy into small fibres from existing light sources can be expensive, as they were not designed for this purpose.

Most light emitting devices consist of a light producing source surrounded by a vacuum or a gas contained in a transparent housing. Or like light emitting diodes by a solid transparent material. Light emitted from the source radiates outward and is reflected or concentrated by external mirrors and or lenses in the correct direction and concentration.

However these lenses and mirrors have to be accurately manufactured and are relatively expensive, they also absorb some of the energy that is being produced and due to manufacturing limitations, usually fail to match the shape of the light from the source, they thus cannot control the energy efficiently.

light conducting fibres have a limited acceptance angle, which means that unless the directed light meets the conducting element at the maximum angle or less, the light is not conducted, also every reflection and lens transmission can absorb or scatter between 10 & 30 % of the original light, if we add losses from reflector shape and size, loses from surface input in to the fibre, losses through the bulb containment housing, we are left with a very small balance of the original light. →

In order to overcome this problem many current designs utilise brighter and larger light sources, this comes at a price because these sources produce large amounts of heat energy which combined with bad directional control can over heat the bulb and the light conducting fibres, this means that an external fan or cooling device must be used, this adds cost and bulk and the whole process requires more energy. These factors all limit the commercial applications for light conducting elements, as the commercial cost out ways the usefulness of the product. Or the size of the device and or energy require ments exceed the limitations of product designers.

An object of this invention is to collect light close to the source, where the energy is at its most concentrated, thus saving the requirement for larger and or complex external lenses and mirrors, and to feed this energy directly into the light guide being used, thus saving energy loss at: reflectors, lenses, and containment housings. As the device can use any simple or complex, state of the art system it can be mass produced.

Even where direct connection is not required the light energy is output in a very concentrated form which allows smaller light guides to be connected to the devices output, saving the cost of larger light guides used at the moment.

Where very large amounts of energy are required, existing devices are limited by over heating of the separate components, this device allows a cooling system to be employed easily and the excess heat energy to be converted into usable energy if required. The device may also be made much stronger for longevity and can be used in vehicles, where for example if required the device can be linked to the vehicles own cooling system. These devices can be much more efficient and in some cases may not require cooling systems, in applications that do currently.

The combined emission and collection device, surrounds the Light emitting device, or filament or arc etc., of a light bulb or solid state light emitting device, by one or more light conducting elements, that are touching or slightly spaced from that element, arc, etc. or in the case of solid state lights, i.e. light emitting diodes, the light conducting element is inserted into the solid as part of the solid. but in all cases the light conducting element, is designed to carry light from the source of the bulb, or device, to the edge of its case, through vacuum or gas, liquid or solid. the light conducting element can stop at or on the inside of the case, or continue through the outer case, which is still sealed or solid, to a distance that is directly to the required output of the light, or to a distance and shape, that is suitable for the easy connection of flexible or other light guides, or light conducting devices.

The number of these internal light conducting elements can be reduced by internal mirrors and or lenses, and their collection or function, enhanced by the use of state of the art materials, solids, or coatings. The covering of the bulb, solid or case, may no longer all be required, for the transferral of light, and therefore can now be constructed moulded, from a non transparent state of the art material, for example a metal, that would allow the total device to be stronger and have any desired property. The interior gas or liquid, or case can be used to circulate a gas, or liquid, to collect heat energy for cooling or energy maximisation, through for example a heat exchanger, which can be incorporated as part of the device.

Preferred embodiments of the invention will now be described, with reference to the accompanying drawings in which:

FIGURE 1 shows a side view of a device with a light emitting element in a vacuum, surrounded by two light conducting elements and a glass containment housing.

FIGURE 2 shows a top view of a device with a light emitting element in a gas, surrounded by two light conducting elements and a quartz glass containment housing.

FIGURE 3 shows a side view of a device with a light emitting element in a vacuum, surrounded by one light conducting element and a reflector and a glass containment housing.

FIGURE 4 shows a top view, of a section through a device, with a light emitting element in a gas, surrounded by four light conducting elements in a ceramic housing with cooling fins.

FIGURE 5 shows a side view of a section through a device, with a light emitting element in a gas, surrounded by four light conducting elements in a ceramic housing with cooling fins.

FIGURE 6 shows a light emitting element with back reflector, in a solid material, surrounded by one light conducting element and a solid transparent housing.

FIGURE 7 shows a light emitting element with a back reflector, inside of a light conducting element.

As shown in Figure 1. this device comprises of a light emitting element 1 which is in a vacuum 2 contained by a containment housing 4 conducting elements 3 are almost touching the light emitting element 1 and capture most of the energy emitted, this energy is guided out of the device to the end of the light emitting element 5 where the light energy can be used directly, or to a state of the art light guide junction, for onward Transmission. The light conducting elements 3 are solid and being sealed at 6 the point where the light conducting elements pass through the containment housing 4, the vacuum 2 required for the proper function of the light emission, is maintained. The emission part of the device can be any state of the art light emitting system, which usually consists of a positive and negative conductor which carry current into and out of the containment housing via

a light emitting filament or other method. The containment housing 4 is attached to a base 7, in this case the base comprises two main parts that are electrically insulated from each other and thus provide a means of connecting the device to a positive and negative supply of electricity, as well as having a screw thread that allows the device to be secured. However this could be any state of the art base, electrical connection, or support system.

Figure 2 shows a device which is constructed as described above but the vacuum is replaced with a gas and the containment housing 4 is made from quarts glass.

Figure 3 shows a device which is constructed as described above, but has only one light conducting element 3, light on the other side of the light emitting element 1 is reflected back into the conducting element 3 by a shaped and coated reflector 8.

Figures 4 and 5 are two views of a device which is as described above but the emitting element 1 is surrounded by four conducting elements 3. being a high power device the containment housing 4 is heat conducting and extremely strong and has cooling fins 9. and is made from a state of the art ceramic material.

Figure 6 shows a light emitting element 1 with back reflector 8 which emits a narrow beam of light energy which is collected by the light conducting element 3 and transmitted through the solid housing 4. and carried to the output 5, two conducting terminals provide electrical power to the light emitting element. and the housing in this case plastic, supports the components in relation to each other.

Figure 7. As described above under Figure 6. but the light emitting element 1 is inserted directly into a light conducting element 3, and in this case the plastic material housing and the light conducting element are the same material.

The light emitting element, 1, can be any state of the art electromagnetic energy emitting method, and can be customised to match the light conducting element 3 or elements. The design of the whole device can be arranged in order to minimise any interference with, the output of the electro magnetic energy, and if required enhance its function.

The light conducting elements 3 can be state of the art, for example quarts glass, and coated or multi coated or enhanced by any state of the art light modifying coating. The light conducting element 3 can itself be made by one or more coated elements, for example smaller elements fused together. These elements or composite elements 3 can be manufactured from any state of the art material or process with coatings as above, or process that can enhance transmission function of desired electro magnetic energy wave lengths.

The shape of these light conducting elements can be matched in number and size and shape to maximise the collection of electromagnetic energy from the light emitting element. These light conducting elements 3 can be solid, composite or hollow or liquid or any combination of these or other state of the art light guiding systems, they may also be curved, flexible, sheathed, straight, coiled, amorphous, or have any property or shape that enhances their function.

lenses, or other state of the art light modifiers, Reflectors as in Figure 3. 8, may be of any material, or shape, and can be used in or on any internal or external part of the device, they may be coated or treated with any state of the art coating, or enhancement method.

Any of the light emitting elements 1, mentioned in this description, can be of any wave length or combination of wave lengths, of electro magnetic energy, and one or more light emitting elements 1, may be fitted to any system described in this application.

The combined device mentioned above may have at any part, or parts of its construction, coatings that are so spaced that when a coherent light source, of monochromatic light is emitted from the light emitting device 1, the combined effect is to amplify that emitted light or energy, that is then further enhanced, by materials chosen for there release of electromagnetic energy, when stimulated by the energy from the light emitting element 1, of the device.

The device may be so shaped that the element 1, is almost touching or slightly spaced from its Housing 4, allowing the light to be collected close to the element 1, but on the outside of the housing 4, by a light conducting element 3, attached to the housing containment 4, Utilising reflectors 8, to enhance the systems function

The embodiments shown in Figure 7. and 8. would be particularly suited for providing remote light indication systems. the element 3, can be taken directly to a lighting requirement, via one or more conduit guiding systems. The device being disposable and held in place by a simple retainer The device can be removed from the control system for servicing or replacement without removing any bulk head or cosmetic casings or coverings.

Desirable light modification can be achieved at any point in the total device for example, by moving the light conducting element 3, towards or away from the light emitting element 1, inside the containment housing 4, the output light energy can be made more or less concentrated.

The above and below systems can be incorporated into clothing or articles, or where ever general or artistic lighting requirements, have a requirement for the characteristics mentioned in this application.

Devices as mentioned above, can require very little energy and can be used to provide miniature lighting, for all applications where powerful hands free light is required, especially in hobbies such as attachment to diving equipment, or fishing equipment, as reel or rod illumination, or other hobbies or past times or industrial or domestic, situations. they can be made as disposable and or sterile and or reusable especially in medical and surgical applications.
Miniature devices can act as lighting or indication systems, for miniature electronic assembles or components, or act as relays or communication links, or activate remote control of equipment or other sub assemblies, lengths of light guides can be supplied as part of the component, such that service or construction personnel, can cut the fibre easily to the required length and insert the output end, directly into a holding device or into a conduit as described above.

One or more of these miniature devices emitting infra red or other wave lengths, into an adjacent similar light conducting element, can be used to communicate a function or desired effect, or message, the receiving fibre being connected in a similar way to a receiving and activation device.

For large lighting situations, central lighting can be achieved by large versions of the above device. these large devices can utilise state of the art high power light emitting elements 1, arcs etc., these devices can be used to light a whole building, or other defined area, The enormous heat generated by these units can be controlled in a safe maintenance area, and incorporated into the heating system of the building, via heat exchangers and other state of the art, exchange and control systems, the light conducted from the unit via light conducting elements 3 as described above. These units can be used to provide cold light, that aids the economical running of air conditioning systems, which can overload in peak periods. This system can also be incorporated into day light collection systems, as enhancement or back up, with the energy being converted to heating water, when the sunlight provides enough electricity for total lighting requirements, but can reverse instantaneously, should the sun be blocked by cloud etc.,

The above devices can be used in any situation where, remote and or efficient light or heat energy, is required for communication or inspection or control or heating, or educational or any other application.

For example a small device directly connected to a flexible or other light guide, can be kept on an enclosed or open reel, which is then pulled out and used as an inspection light, the device being on a reel which is sprung loaded, so that when a retainer is released the light guide springs back into its case.

Either end of the light conducting device 3, can be shape as a lens or coated or modified to enhance function by any state of the art process or light modification technique for example polarisation of the transmitted light.

all or part of a light conducting element, can be an amorphous light conducting material, that when pressure is applied to the external part of the light conducting element 3, the shape of its end, or other part is altered rather like a remote controlled amorphous lens.

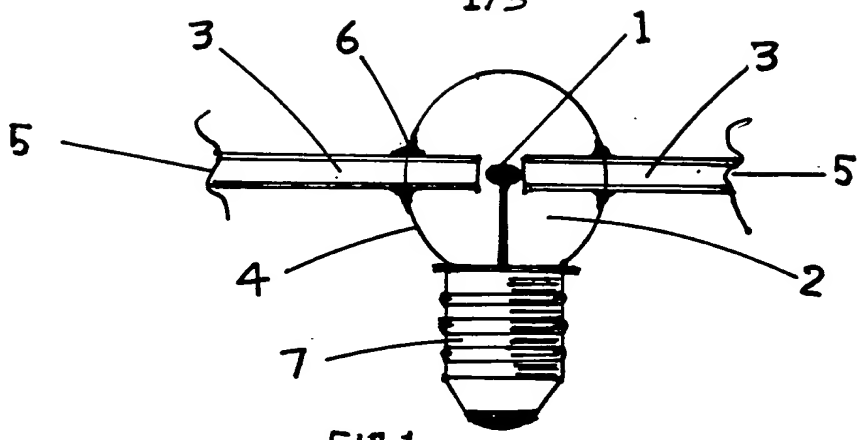

FIG.1

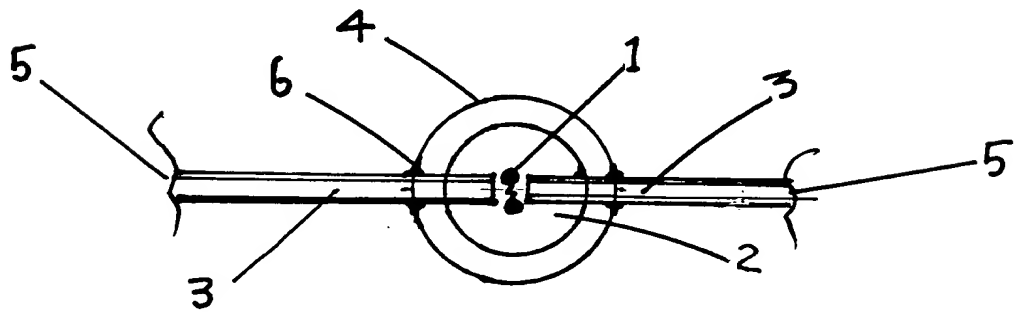

FIG2.

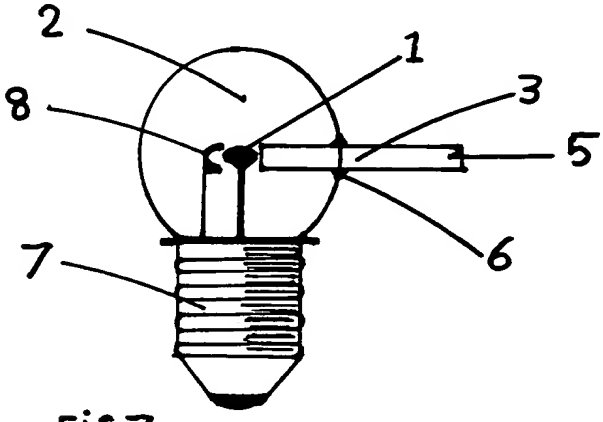

FIG3

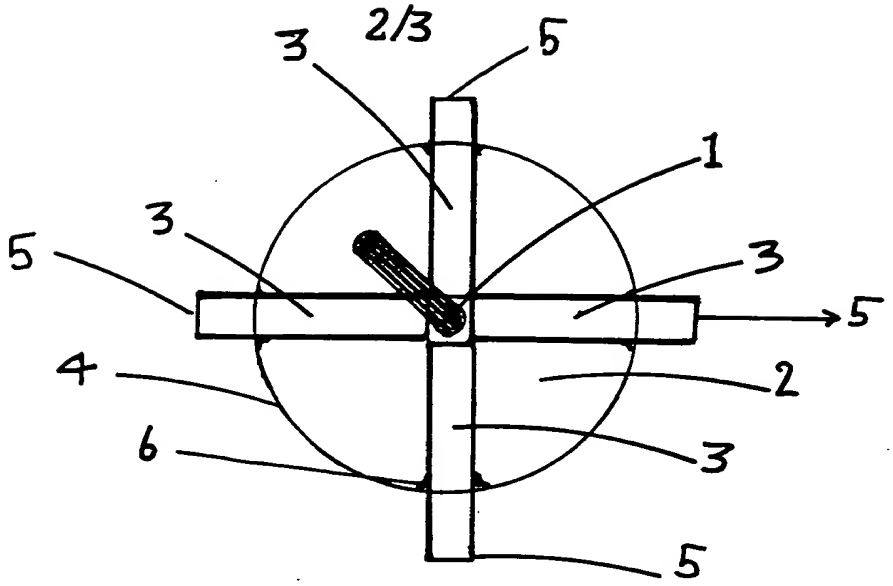

FIG 4

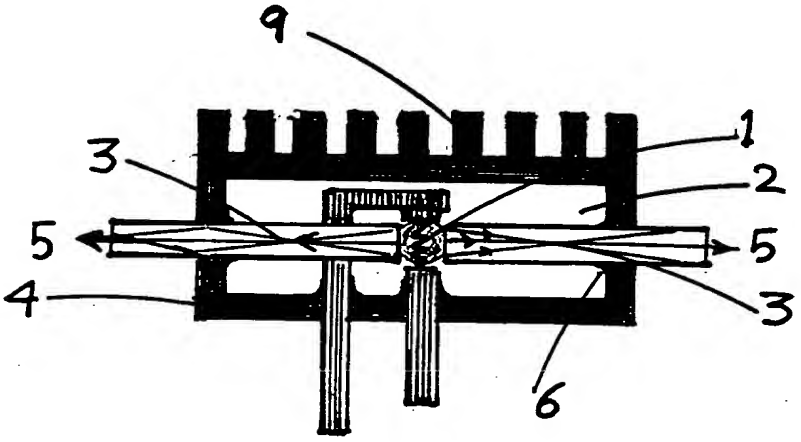

FIG 5

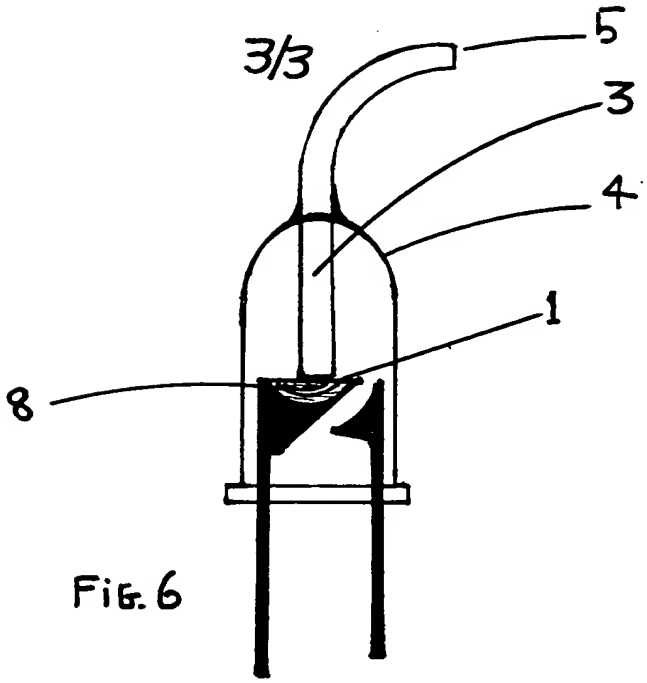

Fig. 6

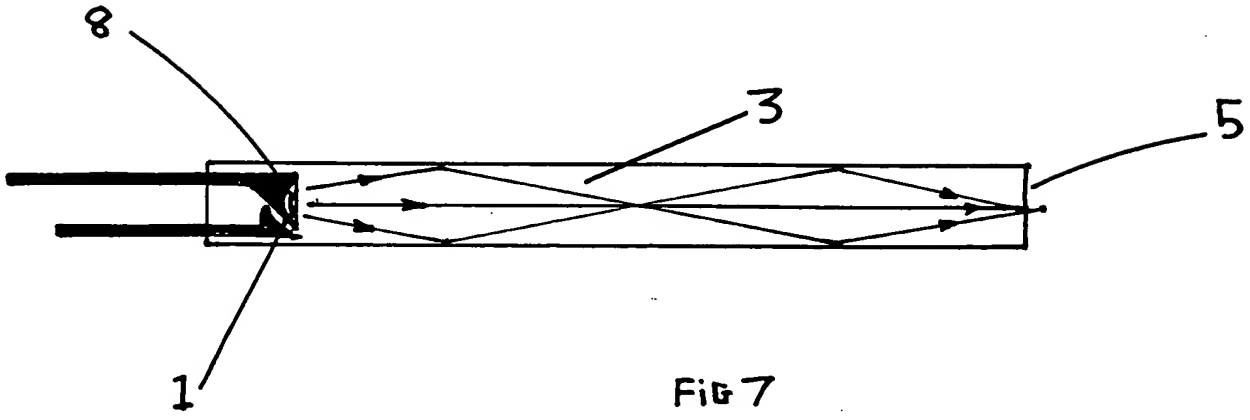

Fig 7